CLAIMS

What is claimed is:

1. A capacitive discharge unit (CDU) for energizing a load, comprising:
   (a) a ceramic capacitor for storing electrical energy;
   (b) a thyristor switch attached onto one side of the ceramic capacitor and electrically connected thereto to discharge the electrical energy stored within the ceramic capacitor in response to a trigger signal provided to a gate of the thyristor switch; and
   (c) a flyback charging circuit comprising a transformer and a diode which are attached onto the side of the ceramic capacitor opposite the thyristor switch to provide the electrical energy to the ceramic capacitor for storage therein.
2. The capacitive discharge unit of Claim 1 wherein the ceramic capacitor comprises a lead lanthanum zirconate titanate (PLZT) dielectric material separating a plurality of spaced-apart capacitor plates therein.
3. The capacitive discharge unit of Claim 1 wherein the transformer comprises a low-temperature co-fired ceramic (LTCC) transformer.
4. The capacitive discharge unit of Claim 1 further comprising a ceramic frame surrounding the thyristor switch, with the ceramic frame being attached onto the ceramic capacitor.
5. The capacitive discharge unit of Claim 4 further comprising a ceramic lid attached onto the frame to enclose the thyristor switch.
6. The capacitive discharge unit of Claim 5 wherein the ceramic frame and the ceramic lid further include electrical conductors formed thereon or therein to conduct the electrical energy stored within the ceramic capacitor through the thyristor switch to a pair of output terminals formed on an outer surface of the ceramic lid.
7. The capacitive discharge unit of Claim 6 further comprising a load attached onto the ceramic lid between the pair of the output terminals, with the load being energized upon discharge of the ceramic capacitor.
8. The capacitive discharge unit of Claim 7 wherein the load comprises a detonator.

9. A capacitive discharge unit, comprising:

(a) a ceramic capacitor having a pair of substantially coplanar major surfaces;

(b) a thyristor switch attached onto one major surface of the ceramic capacitor, with the thyristor switch being electrically connected to the ceramic capacitor to discharge any electrical energy stored therein through the thyristor switch in response to a trigger signal provided to a gate electrode of the thyristor switch; and

(c) a flyback transformer attached onto another major surface of the ceramic capacitor and electrically connected thereto through a semiconductor diode to provide electrical energy to charge the ceramic capacitor.

10. The capacitive discharge unit of Claim 9 wherein the thyristor switch comprises a metal-oxide-semiconductor (MOS) controlled thyristor switch.

11. The capacitive discharge unit of Claim 9 wherein the flyback transformer comprises a low-temperature co-fired ceramic (LTCC) transformer.

12. The capacitive discharge unit of Claim 9 further comprising a frame which surrounds the thyristor switch and is attached onto the major surface of the ceramic capacitor whereon the thyristor switch is located.

13. The capacitive discharge unit of Claim 12 further comprising a lid attached onto the frame to enclose the thyristor switch.

14. The capacitive discharge unit of Claim 13 wherein the frame and lid each comprise a ceramic material.

15. The capacitive discharge unit of Claim 13 wherein the frame and lid each include electrical conductors to conduct the electrical energy discharged from the ceramic capacitor to a pair of output terminals provided on an outer surface of the lid.

16. The capacitive discharge unit of Claim 15 further comprising a load attached onto the lid between the pair of output terminals, with the load being energized upon discharge of the ceramic capacitor.

17. The capacitive discharge unit of Claim 16 wherein the load comprises a detonator.

18. A capacitive discharge unit, comprising:

(a) a substantially planar ceramic capacitor having two major surfaces;

(b) a low-temperature co-fired ceramic (LTCC) transformer attached onto a major surface of the ceramic capacitor and electrically connected thereto through a semiconductor diode to electrically charge the ceramic capacitor; and

(c) a thyristor switch attached onto another major surface of the ceramic capacitor opposite the LTCC transformer, with the thyristor switch being electrically connected to discharge the ceramic capacitor upon triggering of the thyristor switch.

19. The capacitive discharge unit of Claim 18 further comprising a first ceramic substrate for attaching the LTCC transformer to the ceramic capacitor, with the first ceramic substrate including a patterned metallization for electrically connecting the LTCC transformer and the semiconductor diode to the ceramic capacitor.

20. The capacitive discharge unit of Claim 19 further comprising a second ceramic substrate located on a side of the thyristor switch opposite the ceramic capacitor, with the second ceramic substrate having a patterned metallization through which the ceramic capacitor is discharged upon triggering of the thyristor switch.

21. The capacitive discharge unit of Claim 20 wherein the second ceramic substrate includes a pair of output terminals for the attachment of a load thereto, with the load being energized upon discharge of the ceramic capacitor.

22. The capacitive discharge unit of Claim 21 wherein the load comprises a detonator.

23. The capacitive discharge unit of Claim 20 further comprising a third ceramic located between the ceramic capacitor and the second ceramic substrate to enclose the thyristor switch, with the second ceramic substrate providing an electrical connection between the ceramic capacitor and the second ceramic substrate.

24. A capacitive discharge unit formed as a monolithic stacked assembly and comprising a ceramic capacitor sandwiched between a low-temperature co-fired ceramic (LTCC) transformer and a metal-oxide-semiconductor controlled thyristor (MCT) switch, the LTCC transformer being electrically connected to charge the ceramic capacitor through a semiconductor diode located therebetween, and with the MCT switch being triggerable to discharge the capacitor.